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The Columbian Timber Beetle

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The Columbian timber beetle, *Corthylus columbianus* Hopkins, is an ambrosia beetle which inhabits the trunks of many hardwood species in the eastern United States. Infested trees appear healthy and are not noticeably affected by the beetles even after repeated attacks. However, their galleries and the associated stain cause serious degrade to lumber, cooperage stock, and veneer. This defect is commonly known as "flag-worm," "spot-worm," "patch-worm," "grease-spots," "black holes," or "steamboats." Little or none of this defect is tolerated by cooperage manufacturers. However, in veneer and lumber it is a defect in appearance, rather than in structure, so the wood can still be used. Veneer cut from trees is used for corestock and crating; and the lumber is used for framing of upholstered furniture and in painted furniture. Even so, the insect causes a considerable economic loss to the owners or unwitting buyers of infested stumpage. Damaged lumber from soft maple and white oak is put into a special grade, WHND (worm holes no defect); for No. 1 common and better grades, WHND lumber sells at 25 percent or more below the price of undamaged lumber.

A few sawmills make paneling out of damaged red maple, American sycamore, and boxelder; this paneling is considered unusually attractive by some people. Some wormy soft maple and white oak is used for antique-finished furniture. If a decorative wood market similar to that for wormy chestnut could be developed for the damaged wood, it would eliminate the need for control and provide a lucrative outlet for the millions of damaged trees.

Range and Hosts

The beetle has been reported in the eastern United States as far south as Arkansas and north Florida and as far north as Michigan and Massachusetts. It is very common in silver maple and red maple from southern Indiana southward and in chestnut oak and post oak over extensive areas. Infestation of white oak is high in certain areas of West Virginia and that of yellow-poplar is high in certain areas of North Carolina and Virginia. It has also been found in southern red oak, northern red oak, chinkapin oak, American beech, boxelder, American sycamore, yellow birch, American

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basswood, American chestnut, and elm.

Evidence of Attack

Standing trees.—This insect infests all sizes of soft maple ranging from the largest overstory trees down to the small saplings in the understory. New galleries are made by the beetles from mid-May through September. Freshly excavated galleries are marked by light-colored, dry, granular borings adhering to the bark (fig. 1A) outside the round entrance holes (2 mm.).

In decadent soft maple, entrance holes of the Columbian timber beetle may be confused with those of secondary ambrosia beetles. However, entrance holes of the latter are smaller in diameter (1 mm.), and the borings are fine and powdery as compared to the very granular borings of the Columbian timber beetle.

About a week after the gallery is started, sap oozes out of the entrance hole, soaking the borings and wetting the bark. This wet spot is noticeable until the gallery calluses over (fig. 1B), which may not be until the following spring, especially in the case of late-summer attacks.

In thin-barked trees such as red maple, a characteristic bark formation can be used in detecting old infestations. The annual ring laid down over the entrance hole is thickened longitudinally, forming a distinct ridge which causes the bark to split. The resulting elongated scar is 5 to 15 cm. long and tapers to a point at both ends (fig. 1C). Both the ridge and remnants of the hole in the bark persist for several years.

Logs, lumber, and veneer.—Columbian timber beetle damage in logs, lumber, and veneer is evidenced by discoloration associated with the galleries. In species with thick sapwood, such as soft maple, American sycamore, or young yellow-poplar, the stains in the log ends are dark, elongated, radially oriented blotches (fig. 1D). In plain-sawed lumber and rotary veneer, the stains are elongated (6 to 30 cm. long and 0.3 to 2.0 cm. wide at the middle) and taper to a point at both ends (fig. 1E). The stain seems to follow the grain of the wood; hence, it varies in form from straight and symmetrical to very irregular. The width of the stain is dependent upon the number of channels in the gallery (fig. 1E). There are one to five dark, round holes (gallery channels) 2 mm. in diameter in a line across the stain near its center; when the cut has passed through a brood cell, a dark, vertical groove (2 mm. wide by 4 to 6 mm. long) extends upward or downward from the hole.

In the oaks and in very old yellow-poplar, both of which have narrow sapwood, the stain in the log end appears as a dark, flattened "T" if the cut was made near the entrance tunnel (fig. 1F). The top of the T is oriented along the annual rings, and the foot extends toward the bark. When the cut is made some distance from the entrace tunnel, the stain in the log end varies from an elongated blotch to a small dot resembling mineral stain or bird peck. In plain-sawed oak lumber, the stains are usually shorter and more irregular than those in soft maple; and they vary in width from 0.5 to 4 cm. and wider, depending on the orientation of the saw cut with respect to the gallery. A series of holes (the brood cells) and sometimes a groove (a gallery channel) extend across the stain near the middle.

In soft maple, the beetles concentrate their attacks in the lower bole, the number per foot decreasing rapidly with increasing height. In many stands, most of

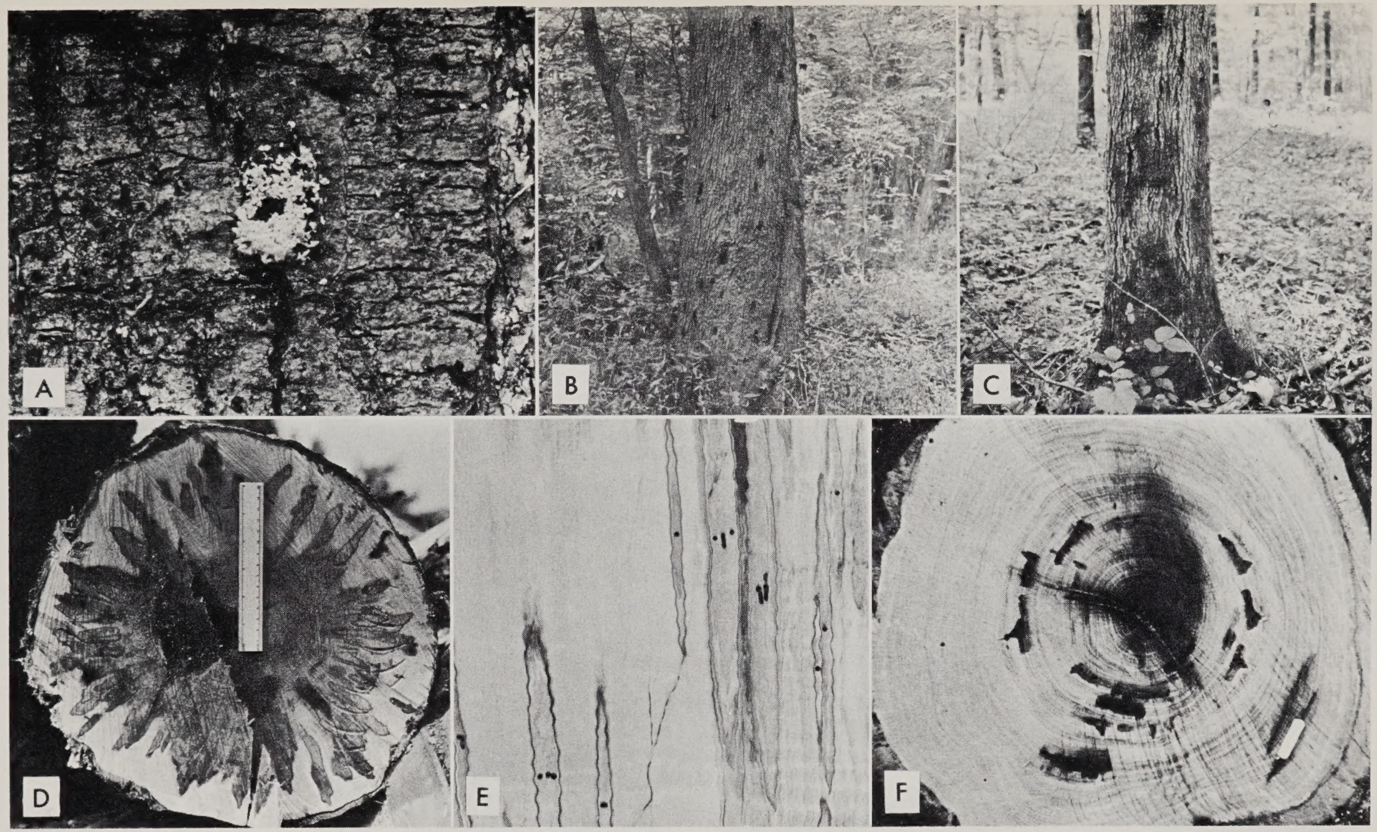

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Figure 1.—Evidence of infestation and damage caused by the Columbian timber beetle: (A) Fresh entrance hole, (B) wet spots indicating unhealed galleries in red maple, (C) longitudinal splits in the bark over old galleries in red maple, (D) damaged log of red maple, (E) damaged rotary veneer of red maple, (F) T-shaped stains indicating damage in white oak stump (white bar at lower right is an aluminum tag). The latter photograph courtesy of C. L. Wilson, Agricultural Research Service, Delaware, Ohio.

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Figure 2.—Life stages of the Columbian timber beetle in red maple: (A) Egg, (B) young larva, (C) mature larvae, (D) pupae (center and right) and young adult (left), and (E) young adult male (note fungal tube [arrow] visible through the thorax).

the trees have been attacked several times during their life span. Consequently, there is little clear wood in the butt logs. Although clear boards could be salvaged from upper logs, the sorting process is considered too expensive. Therefore, all lumber from infested trees is usually graded WHND.

Description of the Stages

Egg.—The egg is white and translucent with a shiny, smooth shell (fig. 2A). It is oval, about 1 mm. long, and about 0.5 mm. in diameter.

Larva.—The larva is a white, legless, C-shaped grub (fig. 2B and 2C). The number of larval stages is uncertain, but there are at least two. The newly hatched first-stage larva is 1 mm. long, whereas the fully mature larva measures about 4 mm.

Pupa.—The pupa is similar to the adult (fig. 2D). It is white at first, but the head and wings become darker with age.

Adult.—The adult is a dark reddish-brown, cylindrical beetle about 4 mm. long and 1.5 mm. in diameter (fig. 2E). The female has a circular, dense patch of yellow bristles nearly covering the front of the head; males are nearly devoid of bristles in that area.

Life History and Habits

The biology of the Columbian timber beetle is best known in soft maple; little is known of the biology in other host species. The time lapse between the initiation of the brood gallery and brood emergence averages 6 to 7 weeks. In Georgia, there are three generations per year: the first brood emerges from late June to late July; the second, from mid-August to mid-September; and the third, from late September to late October. The third-generation adults overwinter in short tunnels under bark scales or under vines, usually at the base of the host tree. They emerge the following May or June and begin excavating brood galleries. In southern Indiana, there are at least two generations per year.

The male starts the gallery; before penetrating the bark or soon after entering the sapwood, he is joined by a female. One or two additional females may enter the gallery later. When completed, the gallery consists of (1) a primary channel which usually extends slightly upward above horizontal toward the center of the tree, (2) one to four secondary channels which branch at right angles to the side of and then run roughly parallel to the primary channel in about the same plane, (3) an occasional tertiary channel branching off a secondary channel in the same manner, and (4) one to 20 or more short brood cells (average length 5 mm.) which extend upward or downward at right angles to the channels (fig. 3).

The eggs are laid and the offspring develop in the brood cells or "cradles." Side projections, i.e., tunnels less than 1 cm. long, sometimes branch off the channels at right angles. The penetration of the longest channel into the sapwood is 2.5 to 6 cm. (In oak, the primary channel first extends to-

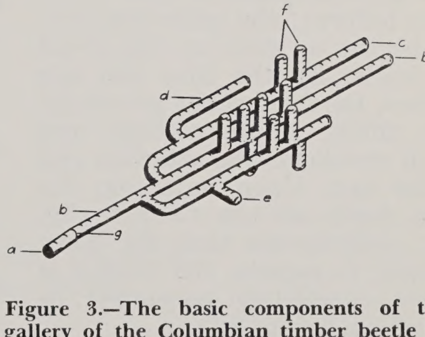

Figure 3.—The basic components of the gallery of the Columbian timber beetle in red maple: (a) Entrance hole, (b) Primary channel, (c) Secondary channel, (d) Tertiary channel, (e) Side projection, (f) Brood cells. The cambium (g) is indicated as a reference.

ward the center of the tree, branches to the right and left just before the sapwood-heartwood interface, and then follows the direction of the annual rings. The brood chambers extend sideways instead of up or down from the gallery channels.) The adults make the entire gallery system, including the brood cells, and push the borings to the outside through the entrance hole.

Soon after the gallery is started, a white ambrosia fungus begins to grow on the gallery walls. The fungus from Georgia specimens has been identified as *Ambrosiella xylebori* Brader, and the fungus from Indiana and West Virginia has been identified as *Pichia* sp. These fungi serve as food for the adults. The fungal spores are brought into the gallery by the male in special tubular organs, called mycetangia, which are located in the thorax (fig. 2E).

One egg is laid in each brood cell about ⅓ to ½ of the cell's length beyond the entrance (fig. 2A). The entrance of the brood cell is then plugged with tightly packed bits of the ambrosia fungus and minute wood particles, which are apparently scraped from the walls of the gallery channel by one of the parents. Soon after oviposition (but sometimes before), the ambrosia fungus begins to grow on the brood cell walls. By the time the egg hatches, the fungus has grown into a thick, white, cottony mat which envelopes the attached end of the egg. Upon hatching, the larva feeds on the fungus (fig. 2B); and, by the time the larva is ready to pupate, the fungus is almost completely consumed or deteriorated (fig. 2C).

Pupation and transformation to the adult stage take place inside the plugged brood cell. Both pupal and adult stages are oriented with the head toward the entrance plug (fig. 2D). Adults sometimes leave the brood cells before becoming fully pigmented, but they usually remain in the gallery for several days before emerging.

Natural Control

No confirmed cases of parasitism or predation have been reported for the Columbian timber beetle. Mites are common on the adults, and several species of dipterous larvae have been found near the entrances of the galleries. Nematodes are also found in the galleries and on the adults. The relationships of these animals to the beetle have not been established.

Direct Control

Control measures have not been developed for this insect. Because the use of chemicals would require the treatment of individual trees, perhaps on a yearly basis, the cost would probably be prohibitive. Protection of veneer trees of high value probably could be accomplished economically if control was needed toward the end of the rotation. Persons considering chemical control should consult their county agent or State agricultural experiment station to obtain the latest pesticide recommendations.

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